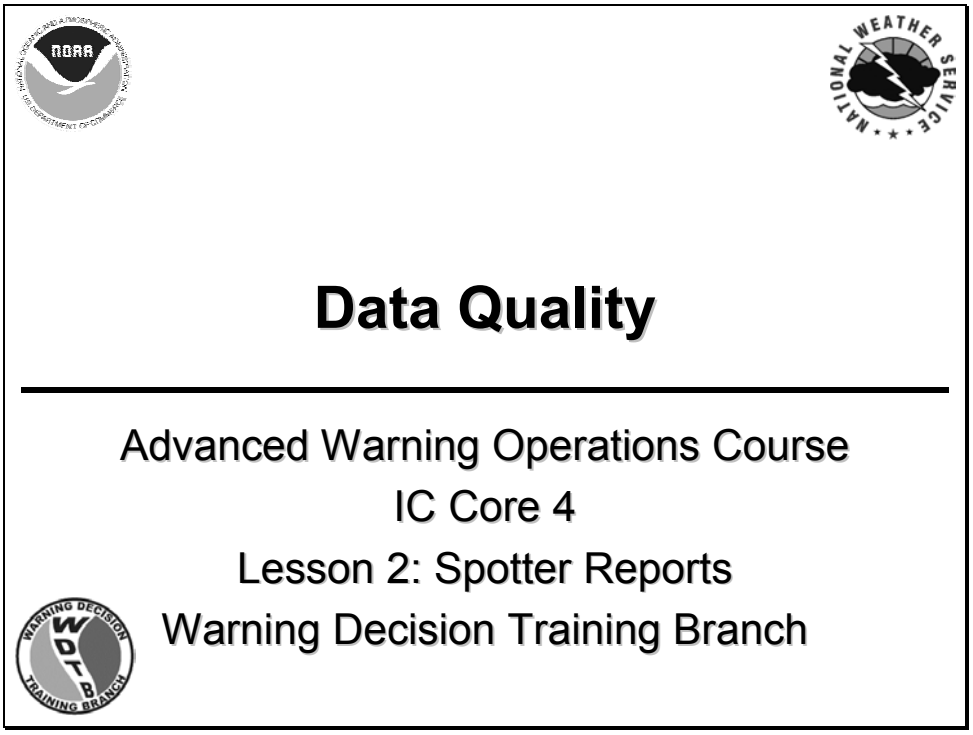
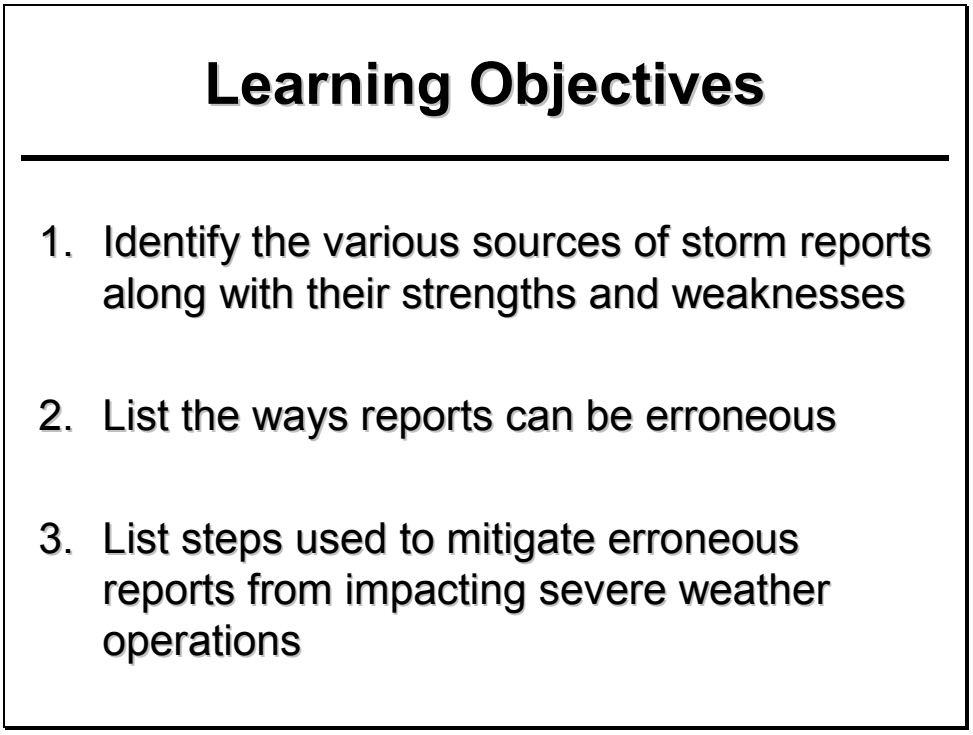
Slide 1



Welcome to the AWOC Data Quality lesson on spotter reports. This lesson should last for approximately 20 minutes.

Slide 2



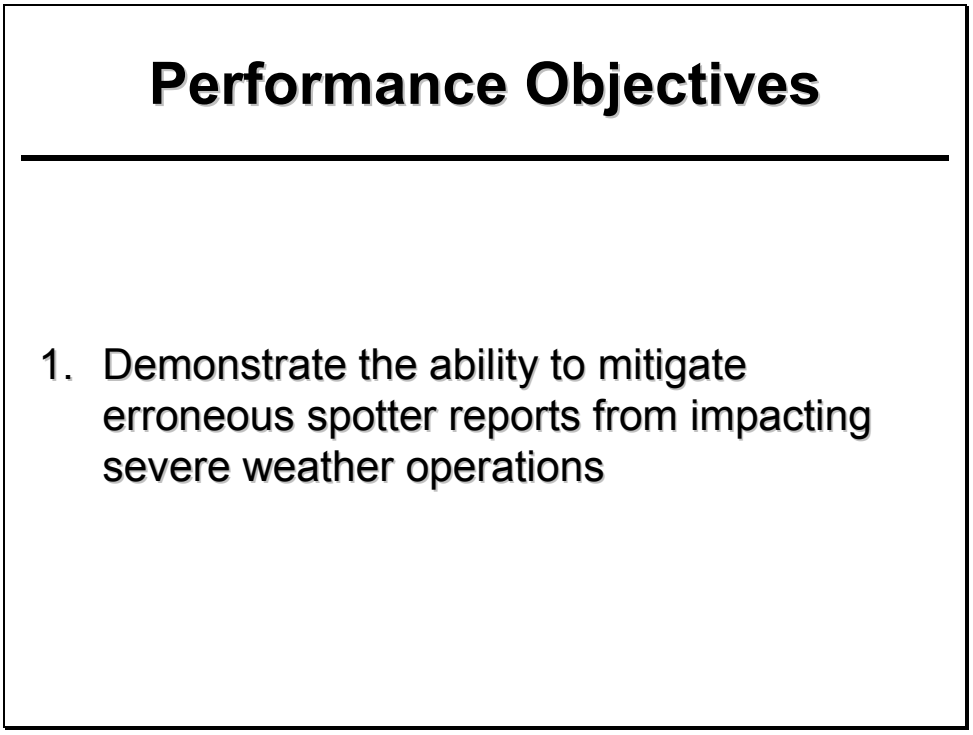
This lesson has three learning objectives:

To identify the different sources of spotter reports for a forecast office during warning operations. Students should be able to identify each source and know their strengths and limitations.

To list several ways for errors to enter storm reports. In some cases, the observation or method of observations is erroneous. In other cases, the communication of that report induces error. Students should be able identify these common sources of error.

To know the basic steps to mitigate erroneous storm reports during warning operations. These steps can be taken to quality control bad reports and minimize their negative impact on warning operations. Students should know how to implement these different steps.

Slide 3



In addition to the three learning objectives, there is one performance objective for this lesson:

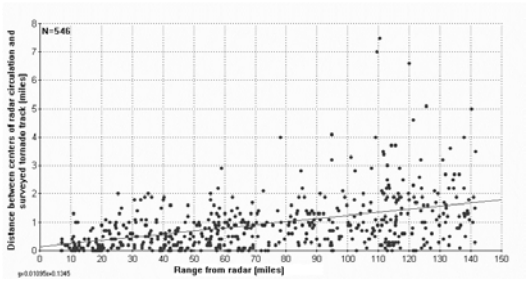
NOTE: Performance Objectives are precise, measurable statements of the behaviors that trainees will be able to demonstrate On-The-Job. They often specify the condition under which the behaviors will be demonstrated as well as the criteria for acceptable performance. (The Performance Objective will NOT be part of the examination process)

The performance objective for this lesson is to demonstrate the ability to mitigate erroneous spotter reports from impacting severe weather operations. It's not expected that all errors will be eliminated or corrected. However, reports with obvious errors should be recognized through simple QC procedures.

Slide 4

Importance of Spotter Reports

- Radar and spotters are crucial in warning ops
- Radar data have limitations
- Spotters help overcome those limitations



We're all familiar with the importance of spotters since observations of any kind are crucial during warning operations. While all observational data have value, radar data and spotter reports are usually heavily weighted during short-fuse warning operations. Radar data, with all of its benefits, do have some significant limitations, especially when looking at small features at long ranges. The graphic above shows that the distance between a tornado track and radar circulation can increase significantly at long ranges (Speheger and Smith, 2004). Spotters are the forecasters eyes and ears in the field. They are very much like other "sensors" that provide observations to the forecast office and help overcome some of radar data's limitations.

Slide 5

Spotter Network Composition

- NWS trained spotters
- Media
- Other "experienced" spotters
- General Public

Like surface observations, spotters compose their own network of sensors. Using this analogy, there are numerous types of sensors in your spotter network. The primary source of data from your spotter network comes from the locally-trained spotters. In a little bit, we'll get into why that's a good thing.

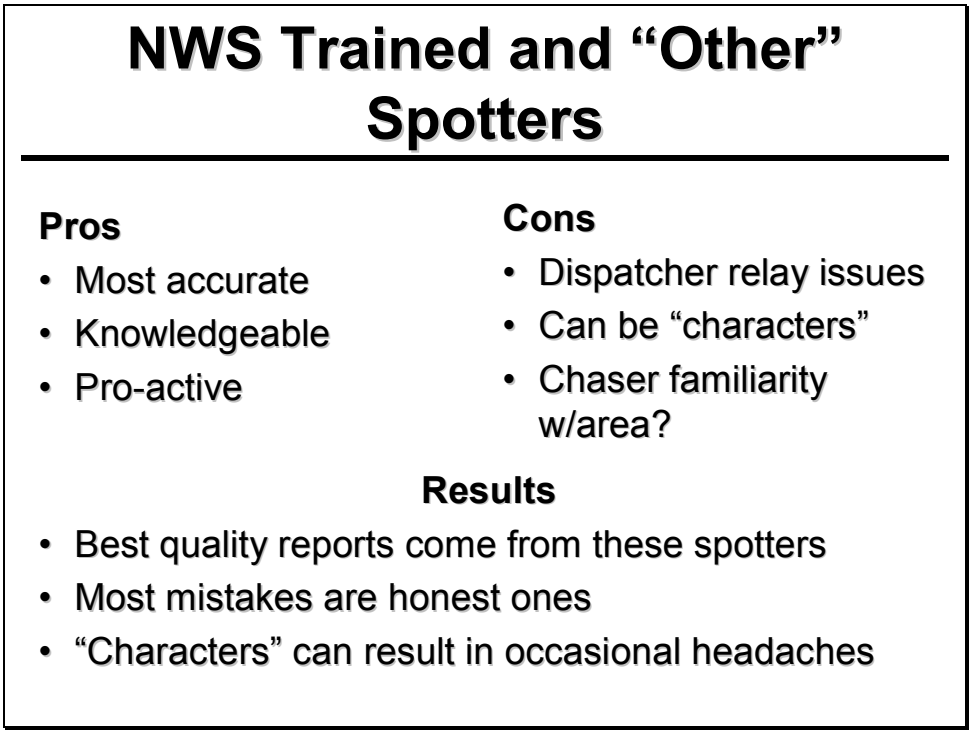
In many parts of the country, the media are also active components of your spotter network. Even in areas less active, the media is an informative communicator. In an ideal environment, they can provide something that the forecaster cannot get anywhere else…real-time video!

In addition to your locally trained weather spotters, you may have other "experienced" spotters in your area. Many times, these other spotters might be storm chasers, researchers, or enthusiasts who are in your area because of the severe weather potential. Many of these folks are very educated about severe weather and are very knowledgeable spotters. They clearly want to help you do your job better. However, there are always a few, let's just call them "yahoos", that are more trouble than they are worth. The difficult thing for you as a forecaster is knowing which kind of person you're observation is coming from. If you are not familiar with a particular chaser, and have questions about their report, it would be wise to be skeptical of the report.

Besides the previously mentioned groups, you also have the general public. This group contains the average citizen, but can also include emergency personnel or other first responders to a weather induced emergency that have no experience or training in severe weather.

All of these different groups, or “sensors”, compose your spotter data network.

Slide 6



Since trained and "other" spotters have many of the same strengths and limitations, they have been grouped together for this discussion:

The strength of these spotters is that they provide the most accurate reports of severe weather that you are likely to get. They are generally knowledgeable about severe weather threats and how they form. They are pro-active. Many use vehicles to track storms and follow a threatening storm. This dedication, understanding, and accuracy make them the backbone of any spotter network.

The most significant downside to reports from this group is due to communication. Many spotters have HAM radio and communicate directly with the WFO. However, some spotters pass reports to the Emergency Manager (or even a dispatcher, who passes along to the EM or forecast office). This "chain" of communication can lead to a data quality issue. Moller (2004) indicated one of the next improvements in spotter training will be to address this issue.

Another potential problem is your local "characters". While these folks may be few and far between, there are probably a couple in everyone's CWA. Many times there may be a political or personal reason for their behavior. Knowing the cause may often help mitigate any problems that occur. Besides local "characters", there can be some issues with chasers. Chasers, while knowledgeable about phenomena, may not have the best grasp of the local area. Errors may creep into these reports as a result.

The bottom line on spotters is that much of the early progress in warning operations are due to these programs. Forecasters have relied on them for up to 60 years in some areas to help detect severe weather. The vast majority of these folks are excellent, although they may make an occasional honest mistake. The people who volunteer to be spotters are generally dedicated and very professional. On average, the most error-prone point in this group is when information takes several steps to make it to the forecast office.

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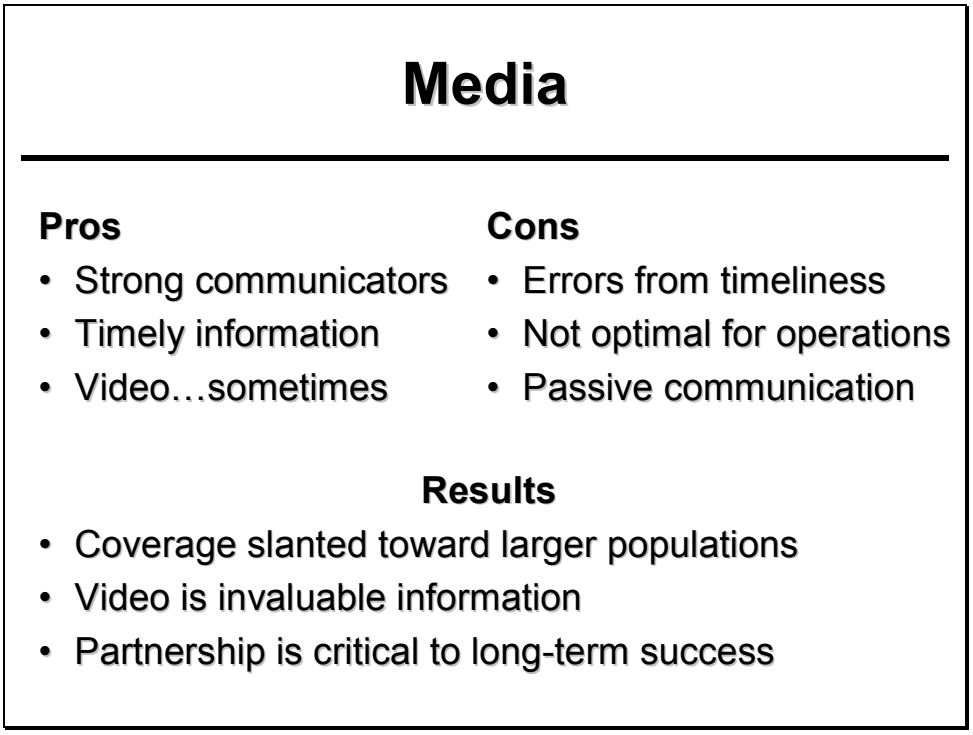


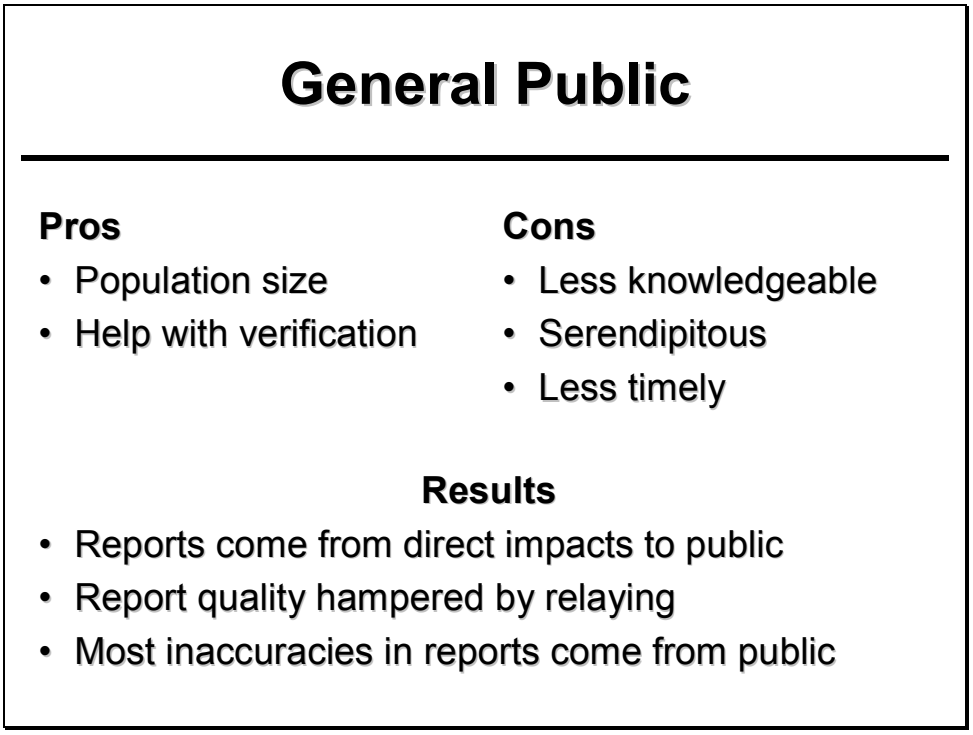
While the media's involvement in severe weather coverage varies around the country, these statements are generally true for broadcast media.

In some areas, the media can be very knowledgeable spotters who provide timely information. In the case of TV reports, they have the potential to provide visual feedback in way of pictures or video footage. Media are also strong communicators who are efficient at getting important information out to people, including forecast office.

The downside to their timeliness is that, because of time pressures, they can relay information that is incorrect. The media may broadcast information in a manner that ultimately results in higher ratings, not in a manner that is optimal to the forecast office. If information is received through broadcast reports, the forecasters have to take the effort to contact the media about any questions they have, which reduces timeliness of the information.

The bottom line with the media is that they vary from market to market. In general, the information that is broadcast by the media will tend to be skewed towards larger populations (more urban info, less rural). If media crews are following a storm and are able to broadcast live, the resulting video is a great benefit to forecasters. A positive partnership between the media and the WFO is critical to the long-term success of both in disseminating severe weather information to the general public.

Slide 8



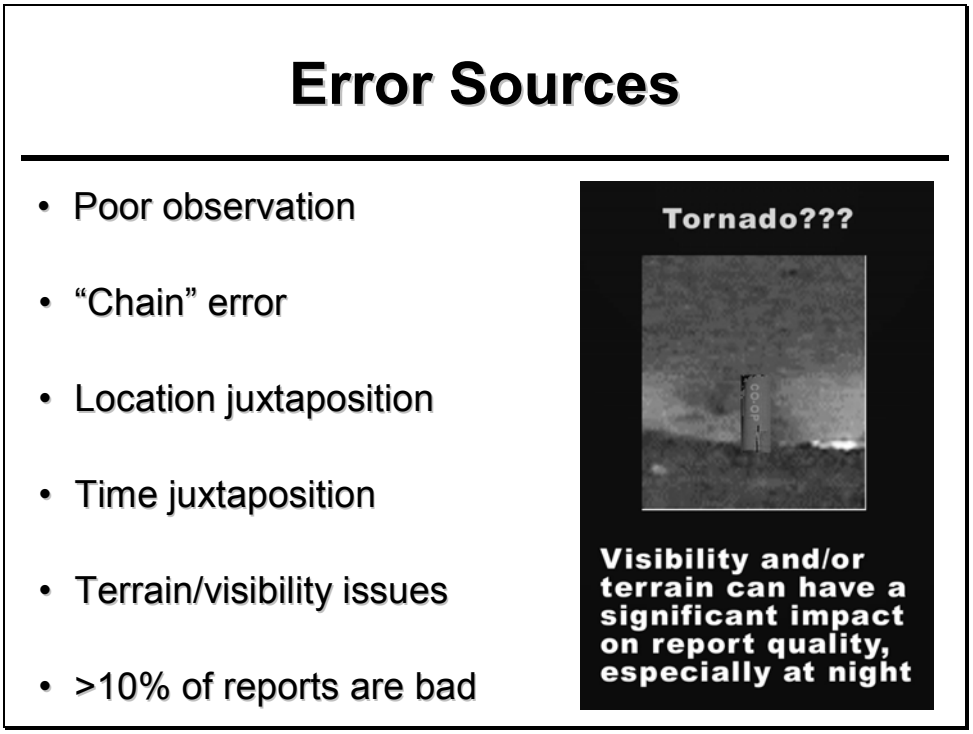
The general public can help fill gaps in your spotter network that are not well covered by your spotter programs or the media.

The general populations greatest asset is in their numbers. In most areas, the general public will outnumber trained spotters by at least an order of magnitude. Having more people means you have a greater chance of observing an event. Even if you do not receive their information in real-time, the general public can still be a great help with verification.

The downside to public reports is that they lack the experience or knowledge about what they are looking at. May people do not know how to relay information to the Weather Service, so these reports are often 2nd (or 3rd) hand. This information may be corrupted in transmission. Many people do not know how to relay information to the weather service if they do see it. These reports tend to be more serendipitous and come in later than other sources.

The bottom line with the general public is that they can provide good information, but it usually has to have a direct impact on them (i.e., damage to house, basement flooded). Since the reports are primarily relayed through a third party, it can be very difficult to clarify any questions that forecasters have about the report. The relaying process itself may even cause errors. Because of their lack of knowledge, their lack of familiarity with communicating reports to the forecast office, and the time lag in getting reports, most inaccuracies in spotter reports come from this group.

Slide 9



Now that we have discussed the sources of reports, lets talk some more about the common sources of error with these reports. Some of these topics were touched on already.

Poor observations – Some observations are just bad, while others are just honest mistakes. For instance, a tornado may stop having a visible funnel cloud near the ground but still produce significant damage. Many times, though, these reports can come in from people lacking the proper knowledge about storms.

"Chain" error – The more people that a report has to go through, the more likely the information will be misreported to the forecast office. Even among knowledgeable people, this process can cause error. Anyone who has played the childhood game "Operator" is familiar with this process.

Location juxtaposition – This problem is a subset, or example, of the "chain" error. This error occurs when someone writes the spotters location down as the location of the phenomenon.

Time juxtaposition – This problem is similar to the previous one, except that it occurs when the received time is written down for the report time. Both this error and the previous one may occur more frequently when there are staffing or workload issues involved.

Terrain/visibility issues – Sometimes a report may be bad because it's just not possible to observe the phenomenon. Remote storms and rain-wrapped (or nocturnal) tornadoes are all examples of this problem. Sometimes even a harmless smoke stack or silo (as in the graphic) can be confused with a possible tornado.

This list is not all-inclusive. However, this list does contain the more common ones. As a result, it should not be a surprise that there is a significant error associated with incoming spotter reports. We are providing a conservative estimate of 10%. Some research suggests that the number could be as high as 30% in some areas of the country (Witt et. al, 1998).

Slide 10

Mitigating Inaccurate Reports

- Maintain good SA
- Match reports to radar
- Try to avoid "chain"
- Know the report's origin
- Can reduce errors by half

Now that we have discussed the sources of error, here are some simple steps to mitigate their impact.

First off, you should maintain good situation awareness. You probably will not be able to quality control every report as it comes in due to time or staff issues. But, with good SA, you should be able to spot the more obvious bad reports.

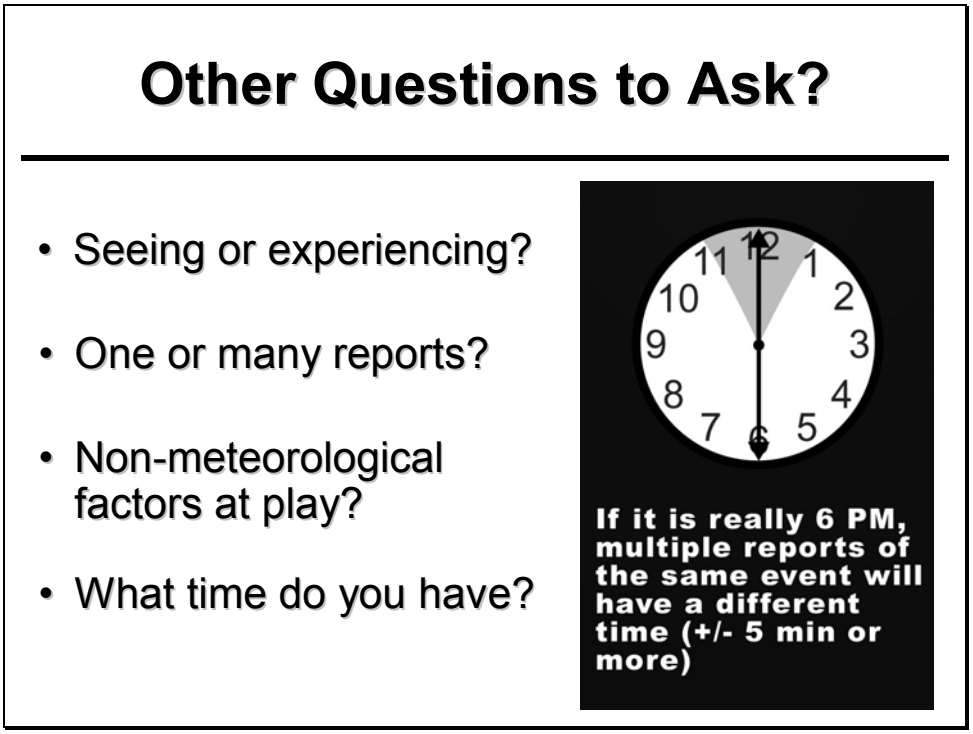
Second, you should use radar data to help QC incoming reports. In some offices, an AWIPS workstation is located next to the HAM radio and phone areas. It is very helpful if these folks can take the time to try and match up incoming reports with radar data for those areas. Many questionable reports can be flagged in this manner. Even if you cannot do this step during warning operations, it is recommended that you do this step as part of any post-mortem exercise.

Another good way to mitigate problems is to avoid "chain" errors. If you get the report from a dispatcher (or even an EM), it's probably a second hand report. It's possible for these folks to receive numerous phone calls from different people with different reports. In such a case, it is easy for some reports to get mixed up, times and locations to be misread, etc. You can't prevent this process from happening, but you can do something about it. If you have received a questionable report that is being relayed through a third party, consider contacting a spotter in that area directly and determine if they can corroborate the questionable report.

Besides knowing if a report is being relayed, it's important to know what type of spotter made the report. Is it a NWS spotter, media person, or the general public? If the report comes from a county with a good spotter network, 80-100% of the events in that county will have at least on spotter report. Conversely, a poor spotter network may only receive reports from 30% of events (Baumgardt, 2004). While anyone can make an inaccurate report, trained spotters are the best source of information during events. If a member of the general public or media has provided a report that appears questionable, getting a report from a trained spotter in that same area may help clarify the issue.

You probably won't catch every bad report using these steps, but you may be surprised by how many you do. These simple steps could reduce your inaccurate reports by half, maybe more.

Slide 11



Here are some other questions to ask yourself (or better yet, the spotter)…

Are they seeing it, or are they experiencing it? For instance, does the person see a tornado, or has the tornado just ripped off their roof? The farther physically removed from something we are, the more likely we are to make a mistake in observing it. A common example is the apparent change in the size of the moon between moonrise and its peak in the sky. It looks so much bigger at moonrise because we have objects next to it to give it a frame of reference. Our eyes can be deceived by storm features that are far away much easier than by more material evidence (such as storm damage).

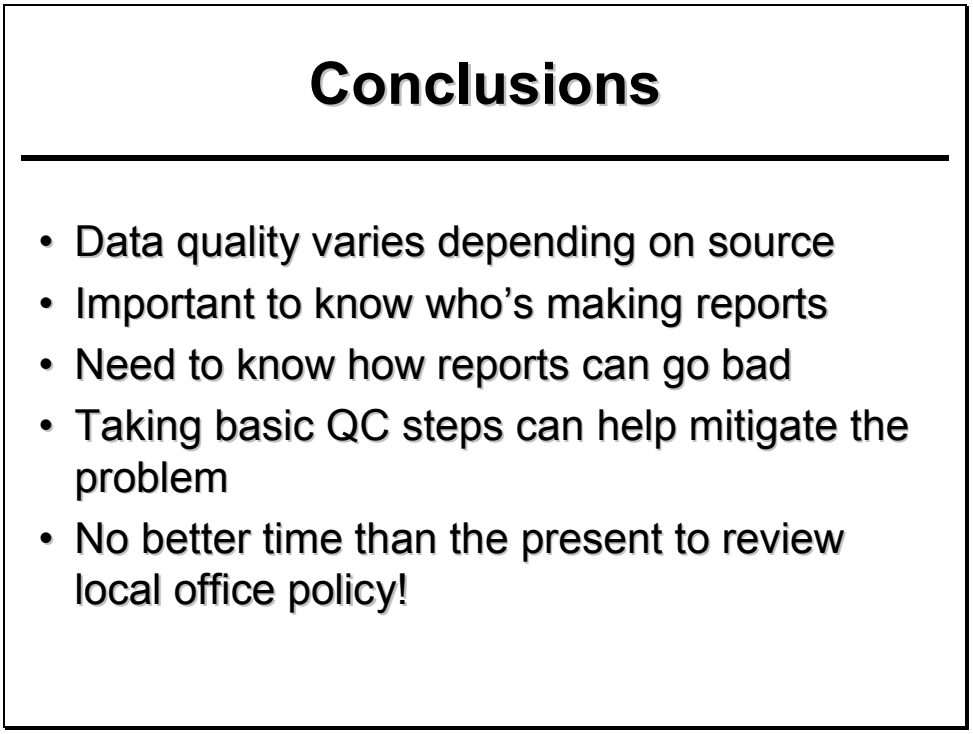
Is there only one report? Let's face it, there will always be times when only one report is received for a particular storm. During the May 3rd tornado outbreak in OK and KS, 17% of the tornadoes were reported by only one source (Speheger et al., 2001). Since most storms will not garner that much interest from knowledgeable spotters, the percentage for most severe weather events will be higher than that. It's always nice if you can get multiple spotter reports of an event, but many times it just will not be possible.

Are there any non-meteorological factors at play? Using the graphic above, how many reports do you expect to get from a forest vs. a large subdivision?

What time do you have? You may think a report sounds inaccurate, but the reason may be the observer's watch is off. Witt et al. (1998) used a +/- 3 min window on all severe reports in Storm Data to verify a radar algorithm because of uncertainty in the reports. A variation of +/- 5 minutes is probably a reasonable variance to assume with incoming

reports. That's a volume scan, give or take. In extreme cases, it's possible for reports from fast moving storms, or even storms far from the radar, to appear bad because the observer just kept incorrect time.

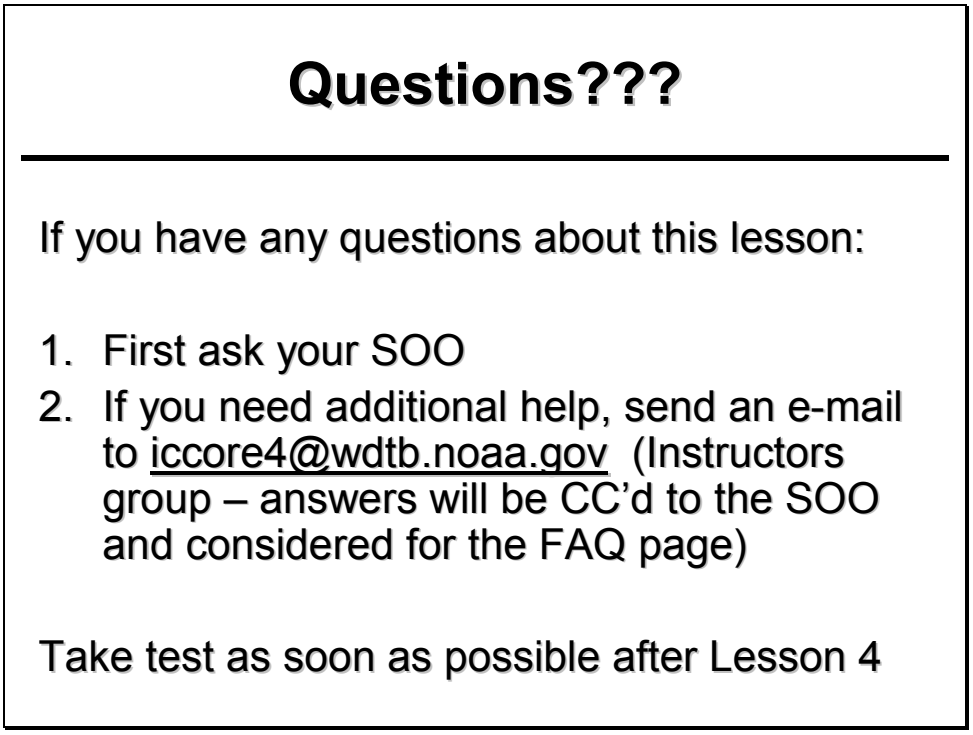
Slide 12



A key point of this lesson is that the quality of information we receive from spotters depends on the source of that information. Experts make mistakes and novices can give very accurate information. However, it's still important to know the source of the information because it can give you a hint of the general quality of the information.

Besides knowing the source of the information, you need to know how a report can go bad. While bad data is a single destination, there are many ways to get there. Being familiar with the more common sources of error will help you identify a bad report when it comes in. Identifying a bad report allows you to mitigate the impact that report has on your operations. Several ways to help do that were presented here, but you may have some of your own. In fact, your office may have some local policies that may help address some of the error situations presented. Now is as good a time as any to review your local policies to make sure you understand them.

Slide 13



If, after going through this lesson you have any questions, first ask your SOO. Your SOO is your local facilitator and should be able to help answer many questions. If you need additional information from what your SOO provided, send an e-mail to the address on the slide. This address sends the message to all the instructors involved with this IC. Our answer will be CC'd to your SOO so that they can answer any similar questions that come up in the future. We may also consider the question and answer for our FAQ page. Thanks for your time and good luck on the exam!

References

Speheger, D. A., and R. D. Smith, 2004: On the imprecision of radar Signature locations and storm path forecasts. In submission.

Moller, A., 2004: Personal communications.

Witt, A., M. D. Eilts, G. J. Stumpf, J. T. Johnson, E. D. Mitchell, and K. W. Thomas, 1998: An enhanced hail detection algorithm for the WSR-88D. *Wea. Forecasting*, **13**, 286-303.

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